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GEOPHYSICS

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GEOPHYSICS AS A SCIENCE*

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"Geophysics" means "Physics of the Earth." While in physics one tries to eliminate the effects of the gravitational, electric, and magnetic fields of the earth, in geophysics these fields, their properties and effects, and the structure and properties of parts of the earth are studied.

The science of geophysics can be divided into special fields by using either the subdivisions of physics, as mechanics, electricity, optics etc., or the three major parts of the earth: solid body, hydrosphere, and atmosphere. Moreover, in many cases we have "general" . . . as well as "economic" or "applied" . . . , problems. In the following tabulation which gives some major problems of geophysics by using the divisions just mentioned, general and applied problems are given under (a) and (b), respectively.

	Solid Body	*Hydrosphere*	*Atmosphere*
Mechanics	(a) Forces and stresses; gradual and sudden movements; earthquakes, earthquake waves, elastic and viscous movements; tides; movements of the poles; figure; density; volcanism (belongs also in other sections and geochemistry); mechanical effects of ice, water, wind. (b) Reduction of earthquake damage; seismic prospecting	(a) Tides, waves, currents; hydrology (b) Investigation and prediction of tides and currents for navigation and fisheries; hydrology; echo sounding	(a) Tides, waves including sound; currents (b) Weather forecasting
Gravitation	(a) Gravity; layering; pressure; isostasy; sedimentation (b) Use of pendulum, torsion balance, etc., in prospecting	(a) Layering; sedimentation	(a) Distribution of gases; layering

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	Solid Body	*Hydrosphere*	*Atmosphere*
Electricity	(a) Electric currents and electric waves (b) Electric prospecting	(a) Electric phenomena	(a) Electric phenomena; ionosphere; aurora
Magnetism	(a) Earth's magnetism (b) Magnetic prospecting	(b) Compass; magnetic charts	
Optics		(a) Color and transparency of lakes, oceans	(a) Meteorological optics, halos etc.; color of sky; polarization; turbidity; colors of clouds. (b) Visibility for aviation.
Composition of matter	(a) Composition of the earth; radioactivity; state of the interior	(a) Radioactivity of hydrosphere; salt content	(a) Composition of the atmosphere, ozone, etc.
Heat	(a) Temperature in the earth and its changes; crystalization and melting (b) Thermal prospecting	(a) Temperature in lakes, rivers and oceans; glaciers; icebergs; thermal currents	(a) Thermodynamics of the atmosphere; temperature; climates (include other factors) (b) Climatology

The entire science of Geophysics as sketched above is seldom considered as a separate division of knowledge, comparable to geology or astronomy. One reason for this attitude is the fact that no one person can be familiar with all parts of the geophysical field. Usually, geophysicists either specialize in problems concerning the solid earth, or in oceanography, hydrology or meteorology; some are more familiar with general geophysics, others with economic problems; some prefer questions of mechanics, others of electricity. However, there are many problems which occur in wholly different sections of geophysics, but which require almost the same theoretical treatment. The same equations are to be used for the propagation of earthquake waves, explosion waves in seismic prospecting, in echo sounding in the ocean, and for the investigation of the so called "anormal sound waves" in the atmosphere. Many problems of oceanography and meteorology are similar. In several respects the ocean is an image of the atmosphere with a disturbed layer near the surface of the earth, followed by a layer with decrease in temperature and finally a relatively quiet layer (stratosphere).

Geophysics is a very young science, and this is another reason for

its not being considered as a separate division of knowledge. Meteorology separated relatively early from the science of the "meteors." Oceanography has developed in most countries under the national departments of commerce to reduce the dangers of navigation. Seismological observatories can be found today as a part of geological, geographical, astronomical, meteorological, mining, and engineering observatories and departments. As a rare exception, the Saint Louis University may be quoted, where geology belongs to the department of geophysics.

The relationship between geology and geophysics has been discussed frequently. There can be little doubt, however, that geophysics and geology must cooperate to get a maximum of results. This is a fact from the viewpoint of geology as well as of geophysics, and for problems concerning the structure of the earth's crust as well as for investigations concerning local problems of economic importance.